APPLICATION FOR
UNITED STATES PATENT
IN THE NAME OF

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Assigned to

INTEL CORPORATION

for

DIGITAL RECORDING APPARATUS
REAL-TIME CLOCK

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DIGITAL RECORDING APPARATUS
REAL-TIME CLOCK

BACKGROUND

5   ### 1. Field of the Invention

Embodiments described herein are directed to a digital recording apparatus real-time

clock. In particular, a real-time clock to denote the time and date when a recording is taken is

described.

2. Related Art

10   Existing cameras that denote the date and time of recordings typically use a battery

backed-up clock. Real-time clock chips that require a backup battery are frequently implemented

as well. In addition, synchronizing a free-running clock with a reference clock is another common

way of indicating the date and time of recordings. Basically, existing methods of logging the

date and time of recordings rely on a clock that operates continuously, even while the batteries

15   are being changed.

Current inexpensive digital cameras such as, for example, the Intel Pocket PC camera,

lack a feature necessary for picture organization, namely a real-time clock to denote when each

recording was taken. Such a feature has been omitted in digital cameras because of the cost

involved in adding a physical user interface to set the camera's date and time. The cost of a backup

20   battery that prevents the camera clock from resetting during replacement of the camera's main

batteries is another reason for such an omission. A method of simply implementing a real-time

clock operated by the camera's batteries may fail to date correctly all of the recordings taken

before and after the batteries are changed. As such, a real-time clock mechanism for marking

when recordings are taken that does not require a user interface or a backup battery would prove

25   beneficial.

BRIEF DESCRIPTION OF THE DRAWINGS

A detailed description of embodiments of the invention will be made with reference to the accompanying drawings, wherein like numerals designate corresponding parts in the several

5   figures.

FIG. 1 is a depiction of a digital recording apparatus real-time clock and a computer that reads the media recorded by the digital recording apparatus and provides a date and time reference.

FIG. 2 is a graph that depicts the use of the real-time clock to date recordings since the clock

10   has been reset, according to an embodiment of the present invention.

FIG. 3 is a graph that illustrates the use of the real-time clock to date recordings since docking time, according to an embodiment of the present invention.

FIG. 4 is a graph that distinguishes between recordings taken before and after a change of batteries in the real-time clock, according to an embodiment of the present invention.

FIG. 5 is a flowchart that shows the steps involved in denoting the date and time in

15   which recordings are taken.

DETAILED DESCRIPTION

The following paragraphs describe an embodiment of a digital recording apparatus real-time clock. As shown in Figure 1, the embodiment comprises a digital recording apparatus

20   110 such as a digital camera or a digital video recorder that contains a real-time clock 120 powered by the main battery of the digital recording apparatus 110. The clock 120 resets when the digital recording apparatus's 110 batteries are removed. When a recording is made, the digital recording apparatus 110 marks the recording with the current value of the real-time clock 120, e.g., seconds

since the batteries were changed.

A computer **130** such as a personal computer (desktop or notebook), personal digital assistant, gaming device, or any other device capable of running the relevant software program that reads the media recorded by the digital recording apparatus **110** is then implemented to

5   provide a date/time reference to which to relate the digital recording apparatus's real-time clock **120**. Whenever the digital recording apparatus **110** docks to the computer **130**, the computer **130** records the clock's **120** reading and the computer's **130** date and time. Using these two pieces of information, the computer **130** can calculate, for those recordings (i.e., still photographs as taken by a still digital camera or video clips as taken by a digital video camera) taken since the

10   digital recording apparatus's **110** batteries were changed, the date and time that each recording was taken. A real-time clock **120** may be especially useful in low-end, non-tethered still and video cameras to provide the date and time that a recording was taken.

According to one embodiment of the present invention, Figure 2 depicts a digital recording apparatus **110** that has taken three recordings, namely **210**, **220**, and **230**, since its batteries were

15   changed. At docking time, the computer **130** reads the current real-time clock **120** value of 129,685 seconds since reset and records that value as being equal to the computer's **130** current date and time of October 10, 2001 at 9:05:17am. Now suppose recording **230** has a recorded clock value of 122,434. The computer **130** can fix that recording's date and time as 7,251 seconds before 9:05:17am; that is, 7:04:26am. The computer **130** can similarly find the date and time

20   that recordings **210** and **220** were taken.

Another scenario for consideration is the situation whereby the digital recording apparatus **110** is undocked and records several additional recordings. Figure 3 illustrates how the computer **130** can, at a later date, calculate the dates and times of each such recording by examining the

difference between the real-time clock **120** at the time a recording was taken and the real-time clock **120** at the time of last docking. For example, a recording **310** may have a recorded clock value of 162,085, indicating that it was taken 32,400 seconds after docking, namely at 6:05:17pm on October 10, 2001.

5   An additional scenario for consideration is that whereby the digital recording apparatus **110** was docked, recordings were then taken, the battery was then replaced, and additional recordings were subsequently taken. Depending on the duration of time in which the digital recording apparatus **110** remained idle between recordings, the computer **130** may not be able to detect which recordings were taken before the battery was replaced from those that were taken after the

10   battery replacement.

One refinement corrects the above-described problem. By making the real-time clock's **120** range at least twice the maximum anticipated battery life of the digital recording apparatus **110**, and upon docking, advancing the real-time clock **120** past the midpoint, the computer **130** can always determine whether a recording was taken before or after battery replacement. That is, those

15   recordings taken between docking and battery replacement will have real-time clock **120** values that are greater than one-half the range of the real-time clock **120**. Meanwhile, recordings taken between battery replacement and a succeeding docking will have values that are less than one-half of the real-time clock's **120** range.

Figure 4 illustrates such a refinement. At docking, the real-time clock **120** is set to

20   3,000,000, and correlates to October 6, 2001, at 4:31:45pm. Recordings **310, 320, 330,** and **410** will have times greater than 3,000,000 seconds, indicating that they should be correlated to the real-time clock **120** value at last docking. In contrast, recordings **210, 220,** and **230** will have times less than 3,000,000 seconds, indicating that they should be correlated to the time of the

current docking. The digital recording apparatus real-time clock thus has the ability to calculate unambiguously the date and time for each recording, despite that the real-time clock **120** was reset when the user changed the digital recording apparatus's **110** battery.

Figure 5 is a flowchart that shows the steps involved in dating recordings. Step **510** shows

5   that on docking the digital recording apparatus **110** to the computer **130**, the real-time clock **120** is read. Next, the computer's **130** current date and time are read, as illustrated by step **520**. Step **530** depicts the reading of the computer's **130** stored clock value and date and time from the previous docking. As illustrated in step **540**, recordings from the digital recording apparatus **110** are then downloaded to the computer **130**. The recording's clock value at capture is then read. As

10   shown in step **560**, it must then be determined whether this value is greater than one-half of the real-time clock **120** range. If so, then the recording's date and time relative to the clock value and date and time from the previous docking (from step **530**) is calculated. This action is shown as step **570**. Else, the recording's date and time relative to the real-time clock **120** value and the computer's **130** current date and time (from steps **510** and **520**) is calculated, as illustrated

15   by step **580**. As depicted in step **590**, it is next determined whether the real-time clock **120** value is less than one-half of the clock's **120** range. If yes, the real-time clock **120** is then set to one-half of the real-time clock's **120** range, depicted as step **600**. As shown in step **610**, the real-time clock's **120** new value and the computer's **130** current date and time are then saved as previous docking values.

20   While the above description refers to particular embodiments of the present invention, it will be understood to those of ordinary skill in the art that modifications may be made without departing from the spirit thereof. The accompanying claims are intended to cover any such modifications as would fall within the true scope and spirit of the present invention.

The presently disclosed embodiments are therefore to be considered in all respects as illustrative and not restrictive; the scope of the invention being indicated by the appended claims, rather than the foregoing description. All changes that come within the meaning and range of equivalency of the claims are therefore intended to be embraced therein.